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April 20, 2004

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APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A  
FILING DATE.

APPLICATION NUMBER: 60/439,512

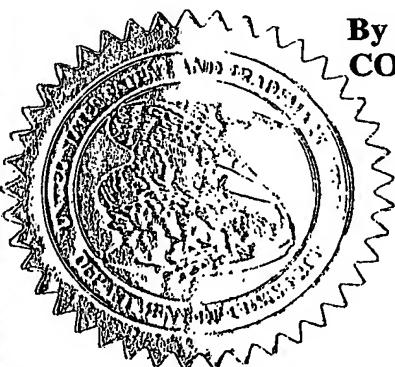
FILING DATE: January 13, 2003

RELATED PCT APPLICATION NUMBER: PCT/US04/00727

By Authority of the  
COMMISSIONER OF PATENTS AND TRADEMARKS



P. SWAIN  
Certifying Officer



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11/12/02  
J-961 U.S. PTO

60433612-01/02

PTO/9B/16 (09-01)

Approved for use through 10/31/2002. OMB 0651-0032  
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## PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No.

### INVENTOR(S)

Given Name (first and middle if any)	Family Name or Surname	Residence (City and either State or Foreign Country)
Bobby Lamar Victor M.	WALTER JR. PINEIROS	RIVERSIDE, CA HUNTINGTON BEACH, CA

Additional inventors are being named on the \_\_\_\_\_ separately numbered sheets attached hereto

### TITLE OF THE INVENTION (500 characters max)

EXPANDED, AXIALLY DISPLACED, INTERNALLY THREADED PANEL  
FASTENER FOR HONEY COMB PANEL STRUCTURE

Direct all correspondence to:

### CORRESPONDENCE ADDRESS

Customer Number



Place Customer Number  
Bar Code Label here

OR

Type Customer Number here

Firm or  
Individual Name

SHUR-LOK CORPORATION, VICTOR M. PINEIROS

Address

2541 WHITE ROAD

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### ENCLOSED APPLICATION PARTS (check all that apply)

Specification Number of Pages

10

CD(s), Number

Drawing(s) Number of Sheets

6

Other (specify)

Application Data Sheet. See 37 CFR 1.76

### METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

Applicant claims small entity status. See 37 CFR 1.27.

FILING FEE  
AMOUNT (\$)

A check or money order is enclosed to cover the filing fees

150<sup>xx</sup>

The Commissioner is hereby authorized to charge filing

fees or credit any overpayment to Deposit Account Number:

Payment by credit card. Form PTO-2038 is attached.

The invention was made by an agency of the United States Government or under a contract with an agency of the  
United States Government.

No.

Yes, the name of the U.S. Government agency and the Government contract number are: \_\_\_\_\_

Respectfully submitted,

SIGNATURE

Date

6 JAN 03

TYPED or PRINTED NAME VICTOR M. PINEIROS

REGISTRATION NO.

(if appropriate)

Docket Number:

TELEPHONE (949) 474-6000

### USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C. 20231.

SP10  
00439512

# Invention Disclosure



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Page 1 of 16

Date: December 09, 2002

## TITLE OF INVENTION:

### **Expanded, Axially Displaced, Internally Threaded Panel Fastener for Honeycomb Panel Structure (Shur-Lok Part Number SL5507)**

#### Inventors

1. Name: <b>Bobby Lamar Waits Jr.</b>	Name: <b>Victor M. Pineiros</b>
Address: 17416 Sun Lake Terrace	Address: 16414 Martin Lane
Riverside, Ca 92503	Huntington Beach, Ca 92649
US CITIZEN	US CITIZEN

## CROSS REFERENCE TO RELATED APPLICATIONS

For the purpose of this disclosure there is prior art from patent number **6,298,633** assigned to Shur-Lok Corporation used in one of the components of this new invention and from a Patent Continuation of **6,298,633** and related disclosure. Also two (2) other methods of achieving flush installed inserts will be used from Patent Disclosures for Shur-Lok Part numbers **SL5407** and **SL5417**.

## BACKGROUND OF THE INVENTION

This invention is in the field of business of aircraft or aerospace craft assembly. It improves the art of attaching honeycomb sandwich panels to structural elements typically found in aircraft structures. It involves an Internally Threaded Panel Fastener which expands upon receiving a driven fastener. It has a plurality of internal components which provide means for producing locking torque as well as having a securing element projecting through an aperture in the sleeve that is bulged by axially contracting ends.

**PROBLEMS WITH PRIOR ART:** Prior art of attaching honeycomb panels for floors or walls in aircraft manufacture requires use of a female threaded clip nut attached to the aircraft structure. Aluminum or plastic inserts are installed in the honeycomb panels. The honeycomb panels are then installed by inserting a screw through the panel insert and threading it through the clip nut.

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Page 2 of 16

The invention subject of this application will eliminate the need for clip nuts in these applications. The Expanded, Axially Displaced, Internally Threaded Panel Fastener for Honeycomb Panel fulfills the function of the panel insert and the clip nut in one single assembly. It installs from the top of the honeycomb panel and provides similar performance as the inserts and clip nuts working together.

Clip nuts cause many problems in the assembly of aircraft, a few of those problems are:

1. Added labor. Primary assembly of panels in aircraft structures requires insertion of the clip nuts in the corresponding holes in the structure. In many instances, when the honeycomb panel is installed, some attachment points are found not to have clip nuts installed. Floorboards need to be removed, clip nuts installed, and then floorboards reinstalled.
2. Changing a clip nut once it is stripped. Removal of floor-boards to change a clip nut and then reinstall floorboard.
3. Clip nut installation on aircraft structure is one cause for galvanic corrosion when the metal clip scratches through the anodized and primed aluminum structural element.
4. Corrosion caused by the clip nut fretting between aircraft structure and inserts in the floorboards and walls.
5. The clip nuts cause the floorboards and wall to be slightly raised off the attachment structure. This causes floors and walls to resonate and cause unnecessary noise and vibration.

## DIFFICULTIES TO OVERCOME:

1. New fastener / insert needs to develop the same load carrying characteristics as the existing insert clip-nut combination.
2. The new fastener / insert needs to work as a replacement part as well as a new aircraft assembly.
3. The new fastener / insert needs to have a positive secondary locking device (fail safe).
4. The new fastener / insert must work within the original installation hole and length requirement.
5. The new locking device needs to reduce or eliminate galvanic corrosion.

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Page 3 of 16

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## SUMMARY OF THE INVENTION

The main purpose or idea behind this invention is to eliminate the use of clip nuts in the assembly of aircraft floors and walls. The installation of this fastener gives the user many advantages over the system currently in use. The advantages of using this system are, but not limited to:

- Labor reduction at assembly and maintenance cycles.
- Elimination of an expensive component (clip nuts).
- A fastener that is rebuildable from the topside surface of panel.
- A fastener that may reduce or eliminate galvanic corrosion.
- A fastener that reduces noise levels in aircraft interior.

Floors and walls having this fastener can easily be removed and reinstalled. If the fastener sub-component should become unusable, the sub-assembly can be removed and replaced without removal of floors or walls.

The clip nuts currently in use are the primary cause for initiation and propagation of corrosion. The initial installation of the clip nut scratches the anodized and primed surface of the aircraft structure and exposes bare aluminum to the elements and thus starts corrosion. Use of this new fastener eliminates that source of corrosion plus the elastomeric material in the assembly helps to isolate the fastener from the aircraft structure and provides a secondary advantage which is noise isolation.

The invention can be described as follows: The housing (Shur-Lok part number SL5507A3-410) is the main component. It is permanently bonded to the honeycomb sandwich panel. The housing contains the working sub-assembly and related components. The sub-assembly (Shur-Lok part number SL5507C3) is molded from elastomeric compounds, proprietary to Shur-Lok Corporation. The sub-assembly contains an upper insert portion that creates thread-locking to meet the requirements of NASM-25027 – Nut Self-Locking specification. The upper insert is molded permanently in the elastomeric compound. The next sub-assembly components are a threaded nut segment (Shur-Lok Part number SL5507D3) and a lower follower segment (Shur-Lok Part number SL5507E3). These final two (2) components are also molded permanently into the elastomeric compound.

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Page 4 of 16

## BRIEF DESCRIPTION OF THE DRAWINGS

Drawing 1	Top Assembly	SL5507-3-410
Drawing 2	Internal Assembly / Sub Assembly	SL5507C3
Drawing 3	Housing Drawing	SL5507A3-410
Drawing 4	Upper Component Drawing	SL5507B3
Drawing 5	Lower Threaded Nut Drawing	SL5507D3
Drawing 6	Lower Follower Washer	SL5507E3

## DETAILED DESCRIPTION OF THE INVENTION

### HOUSING (Shur-Lok Part number SL5507A3-410 - Reference Modified Shur-Lok Part numbers SL5307 / SL5407):

The insert or housing portion is a modified SL5407. The outside diameters and features will be exactly as the current SL5407 exists. The external features are a flange 0.875 inches in diameter having a thickness of 0.02 inches. The body length is varied and dependent on panel thickness. Another external feature is a radial groove having two tapers on each side that is located mid body and has a reduced diameter of about 30 percent of the body diameter that is used to reduce weight. A feature on the cylindrical body of the part, subject of the Patent Continuation referred to above, is a knurled or serrated portion next to the flange that is used to retain the insert after installation. This feature is for retaining the insert in place while the adhesive cures. The upper internal feature is a tapered and reduced cross section with a controlled counter bore depth designed to adjust for panel and skin thickness variations, this area will become the flared area after installation. The other internal feature is a controlled countersink diameter that controls screw height after installation.

Modification of the housing will be to the internal bore below the existing countersink. The internal bore will be modified to accept the upper portion of the elastomeric sub-assembly (Shur-Lok part number SL5507C3) and the through hole will be modified to allow the elastomeric sub-assembly (described below) to have radial float as to compensate for panel hole misalignment.

The preferred material for the housing for the purpose of this description will be aluminum but will not be limited to that material in the future.

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Page 5 of 16

**ELASTOMERIC SUB-ASSEMBLY** (Shur-Lok part number SL5507C3):  
The sub-assembly contains an Upper Insert Portion (Shur-Lok part number SL5507B3) and a Lower-Assembly containing a threaded nut segment (Shur-Lok Part number SL5507D3) and a lower follower segment (Shur-Lok Part number SL5507E3).

**UPPER INSERT PORTION** (Shur-Lok part number SL5507B3):

The upper insert portion of the assembly will be manufactured preferably from stainless steel but is not limited to this material selection. The upper insert portion will be tapered on the outside diameter to match the internal taper on the housing. The outside diameter will also have a radial groove to reduce weight and increase the surface area to allow better elastomer bonding. This upper insert portion engages the major diameter of the installation screw thread to provide locking torque per NASM-25027 requirements. The end of the insert portion facing upward will have a countersink to match the flat head configuration of the installation screw, flat head design, but is not limited to that single shape screw. The lower end of the insert portion will have a counter bore that will be used to connect and increase the tensional resistance of the elastomeric portion to be attached later in the assembly process containing the two lower segments.

**LOWER-ASSEMBLY, COMPONENTS:**

The lower components are the actual working units of this assembly and they are what distinguish it from a standard well nut. The two lower components make-up the lower assembly (1 nut segment and 1 follower segment). The distinguishing feature that separates this nut and washer from a standard nut and washer design is that the centerlines of each component are 0.03 inches offset in opposite directions to each other as assembled.

**Threaded Nut Segment** (Shur-Lok part number SL5507D3): Material is stainless steel but not limited to that material. The dimensions of the nut segment are the same as the washer .100 thick and .03 inches offset, the thread is 10-32 UNJ-3B for the standard installation screw for this size; there is no truncation. An additional feature of the nut segment is an arm of material protruding in the opposite direction of the offset with a height that matches the follower segment thickness and fills in the truncated part of the follower segment. This extra piece of material allows the nut and washer to contact the bottom surface of the structure and keeps the assembly from tilting, thus allowing the installed fastener assembly to resist pull out.



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Page 6 of 16

**Follower Segment (Shur-Lok part number SL5507E3):** Material is stainless steel but not limited to that material. The dimensions are .100 thick with a .030 offset through hole. The segment is truncated in the direction of the offset; this allows one side of the segment to be displaced radially outward when the installation screw is engaged.

### ASSEMBLY PROCESS:

The following is the approximate method to assemble all sub assembly components in this invention.

After completing the machining and plating processes, the three (3) components are assembled into a die for elastomeric molding. The mold creates a tapered portion of elastomeric material around the upper segment. As part of the upper segment component, the mold creates a section of elastomeric material plug on the lower part of the segment that fills the counter bore. This portion of elastomeric material does two (2) things: First it starts the long section that will contain the two (2) follower elements and creates a larger bonding surface. Second as a stiffener it also increases the torsional stiffness of the lower sub-assembly during final assembly. In this and any other embodiment of this invention, one can include an armature of fibers or reinforcing mesh to aid the stiffness and durability of the elastomeric material. This completes the assembly of the sub-assembly.

Preparation of the honeycomb panel consists of drilling an installation hole. Most installation holes are controlled as in this process. For the purpose of this disclosure the installation hole is 0.455 inches in diameter. The installation hole diameter is a function of selected fastener and panel and should not be limited to 0.455 inches diameter. The housing portion of the assembly is bonded to the bottom outside skin of the honeycomb sandwich panel with the use of adhesive. The type of adhesive used for bonding is controlled by the end user of the fastener, but for the purpose of this disclosure it shall be Epi-Bond 420 but not limited to that selection.

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Page 7 of 16

Adhesive is applied to the top side of the flange of the housing or to the honeycomb panel surface around the installation hole. Install the panel fastener housing into the installation hole up to the panel retention feature (knurl or serration). Press down on the back of the insert flange until the retention feature pops in and the flange of the insert bottoms out against the outside skin of the panel. Using the Shur-Lok installation-flaring tool, put the pilot into the through-hole until the tool stops against the top of the insert. By use of a press or similar device to create a compressive load, press down until the installation tool stops against the top surface of the panel. The housing is now fully installed. Curing of the adhesive should be carried out according to adhesive manufacturer's instructions.

## FASTENER INSTALLATION:

The final part of the assembly is to put the assembled honeycomb sandwich panel into the aircraft. After the preliminary location of the panel is found, put the internal sub assembly into the housing. Acquire the appropriate assembly screw and install through the upper insert portion until resistance is felt through the screw. Start turning the screw clockwise until the final assembly torque is reached. During the torquing sequence the lower assembly elements are drawn up against the structure. As the lower assembly is drawn up by the screw action, the external surfaces of the elastomeric material expand radially outward, creating a positive seal between the panel fastener and the aircraft structure. This positive seal provides pull out strength (fail safe), and noise and vibration dampening.

## FASTENER REMOVAL AND REPLACEMENT:

Removal of the honeycomb sandwich panel is accomplished by removing the installation screws and separating the panel from the structure. The elastomeric sub-assembly of the panel fastener may be left inside the housing or easily removed and replaced with a new sub-assembly.



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Page 8 of 16

## CLAIMS

What is claimed is:

**Claim 1:**

An Internally Threaded Panel Fastener comprised of five (5) components for attaching honeycomb sandwich panel to create floor and walls in aircraft structures.

**Claim 2:**

The Internally Threaded Panel Fastener of claim 1 that eliminates the use of clip-nuts for attaching floors and walls in aircraft.

**Claim 3:**

The Internally Threaded Panel Fastener of claim 1 that when installed is flush on the top skin surface.

**Claim 4:**

The Internally Threaded Panel Fastener of claim 1 that is rebuildable from the topside of the panel.

**Claim 5:**

The Internally Threaded Panel Fastener of claim 1 that contributes to the reduction of labor costs associated with aircraft assembly i.e. (floor and walls), by making it possible to conduct all assembly work from the topside of the panels.

**Claim 6:**

The Internally Threaded Panel Fastener of claim 1 that contributes to the reduction of labor to the aftermarket airline market by allowing maintenance of floors to be conducted from the top skin surface.

**Claim 7:**

The Internally Threaded Panel Fastener of claim 1 that creates a secondary lock during final assembly.

**Claim 8:**

An Internally Threaded Panel Fastener that contributes to the reduction or elimination of noise pollution in aircraft cabin compartments.

**Claim 9:**

An Internally Threaded Panel Fastener that contributes to the reduction or elimination of galvanic corrosion.

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Page 9 of 16

## ABSTRACT

The Internally Threaded Panel Fastener contains five (5) components and improves the art of attaching floor and wall panels to aircraft structures. This panel fastener eliminates the need to stock, install and maintain a third element of the standard fastening system- the clip-nut. The insert uses elastomeric materials to complete a sub-assembly element that installs from the topside of the panel eliminating the need to go below the floor system of an aircraft to perform any secondary work and/or maintenance. The elimination of the clip-nut and the use of elastomeric materials makes floors and walls easier to install and also makes the installation more noise and corrosion resistant. A feature that makes this invention more attractive than any other would be that installation and rebuild ability is accomplished from the topside of the panel. During the final assembly process of floor and wall installation, the fastener develops secondary lock (fail safe). The internally threaded panel fastener was designed, developed and will perform in new installations as well as in replacement parts.

## DRAWINGS

Drawing 1	· Top Assembly	.....	SL5507-3-410
Drawing 2	· Sub-Assembly	.....	SL5507C3
Drawing 3	· Housing / Spacer	.....	SL5507A3-410
Drawing 4	· Upper Nut Component	.....	SL5507B3
Drawing 5	· Lower Threaded Nut	.....	SL5507D3
Drawing 6	· Lower Insert	.....	SL5507E3

## INVENTION TIMELINE:

- Invention was first thought of on or about: 10-25-2001
- Invention was first explained to on or about: Scott Westland and Richard Switzer on 10-25-2001
- First drawings or sketches date: 10-25-2001
- First written description of invention on or about: 05-20-2002

# Invention Disclosure

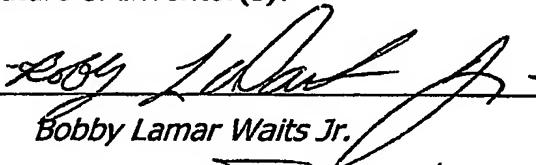


Page 10 of 16

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- A device or product embodying this invention has been made, used or tested on or about :10-16-2002
- A device or product incorporating this invention has been offered for sale or been sold on or about: 10-16-2002
- A technical paper, article, advertisement, other printed document or verbal communication describing the invention has been distributed or communicated outside the company on or about :
  - 10-25-2001 to Boeing Company
  - 11-25-2002 to American Airlines

Signature of Inventor(s):

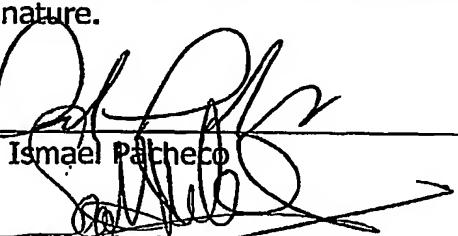
  
Bobby Lamar Waits Jr.

  
Victor M. Pineiros

Witnesses:

Each of the undersigned witnesses declares that he or she has read, understood and signed this Invention Disclosure, including attachments thereto, on the date following his or her signature.

Witness:

  
Ismael Pacheco

Date: 12-24-02

Witness:

  
Scott Westland

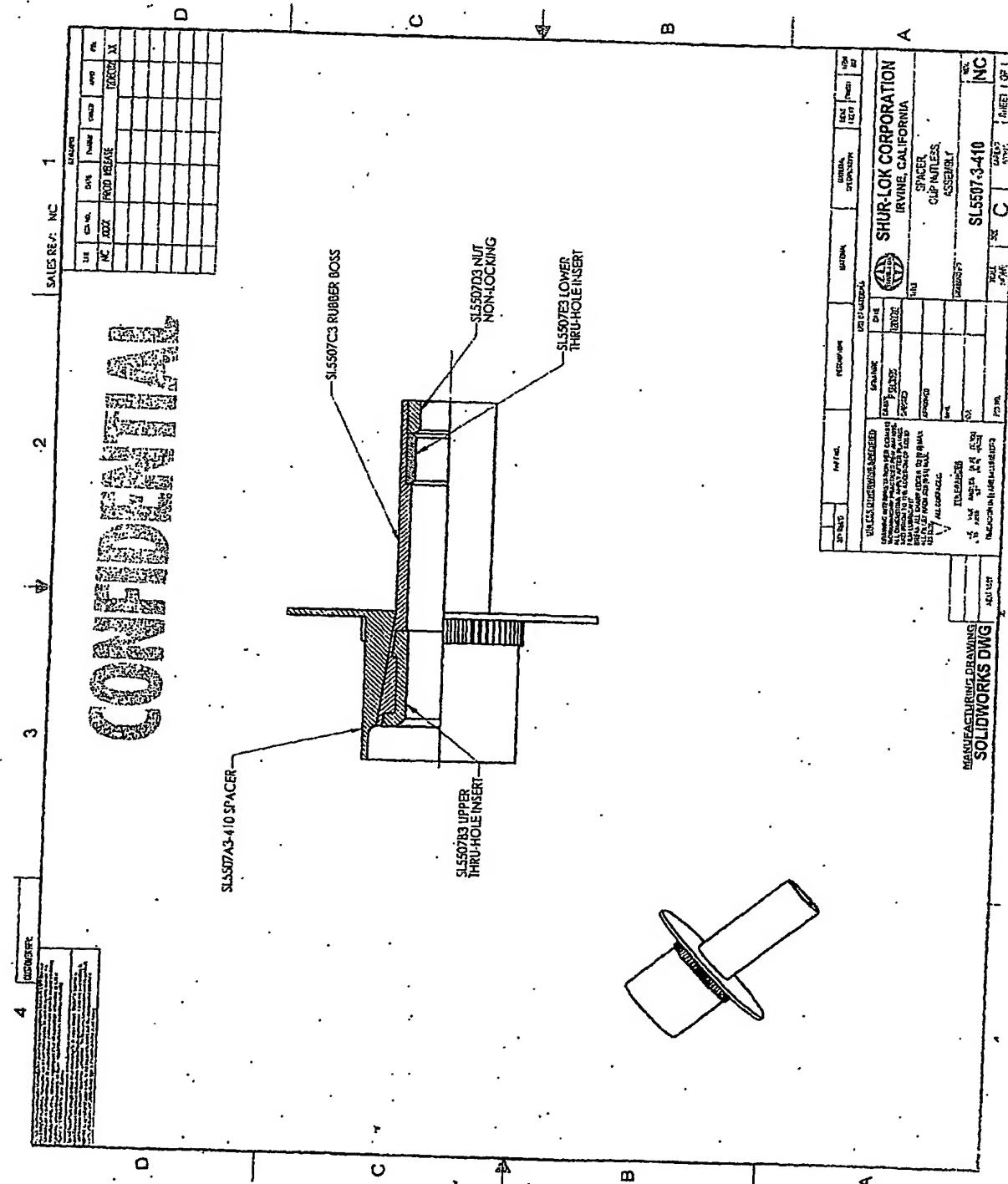
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Page 11 of 16



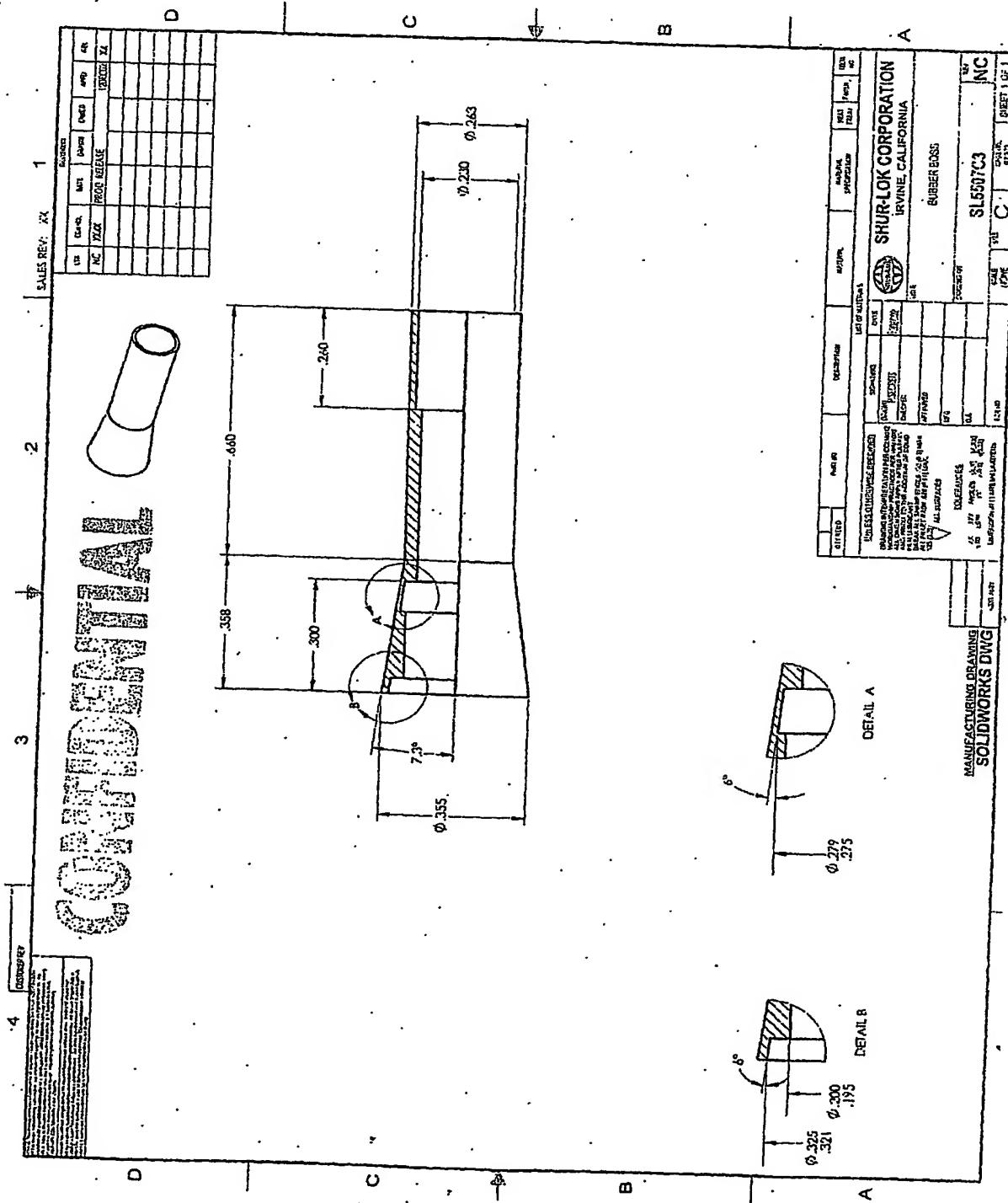
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Page 12 of 16

DRAWING 2





## ***Invention Disclosure***

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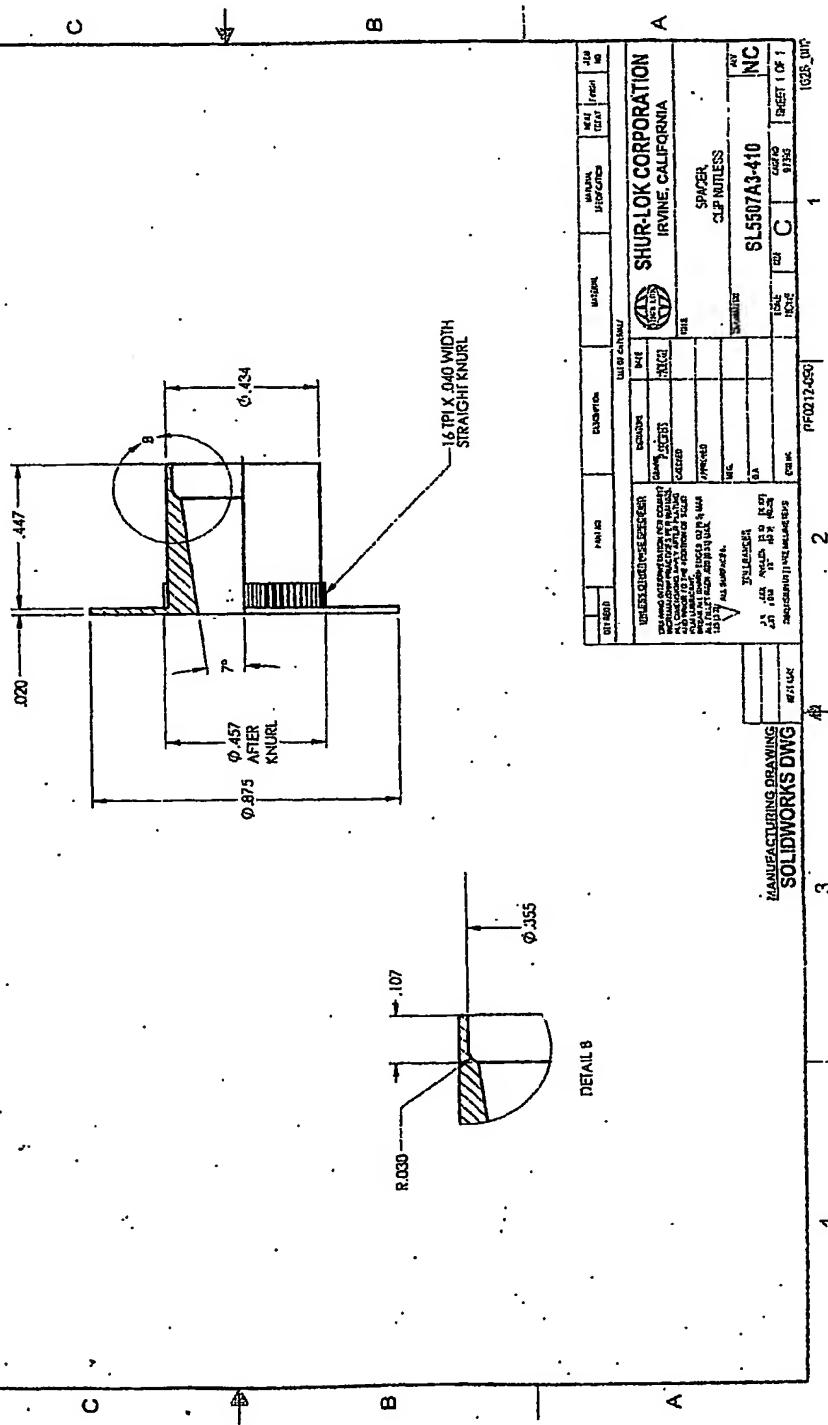
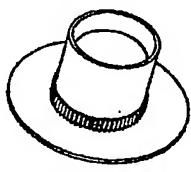
Page 13 of 16

DRAWING 3

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### NOTES:

1. ALL DIAMETERS:  
 MATERIAL: AL ALLOY 6061-T6 PER AMS-QQ-A-225/8.  
 FINISH: PHOSPHORIC ANODIC PER ASMA D3832. APPLY BR-127 PRIMER  
 TO ALL EXTERNAL SURFACES PER MIL-SPEC-1 (OVERSPRAY PERMISSIBLE IN THROAT).





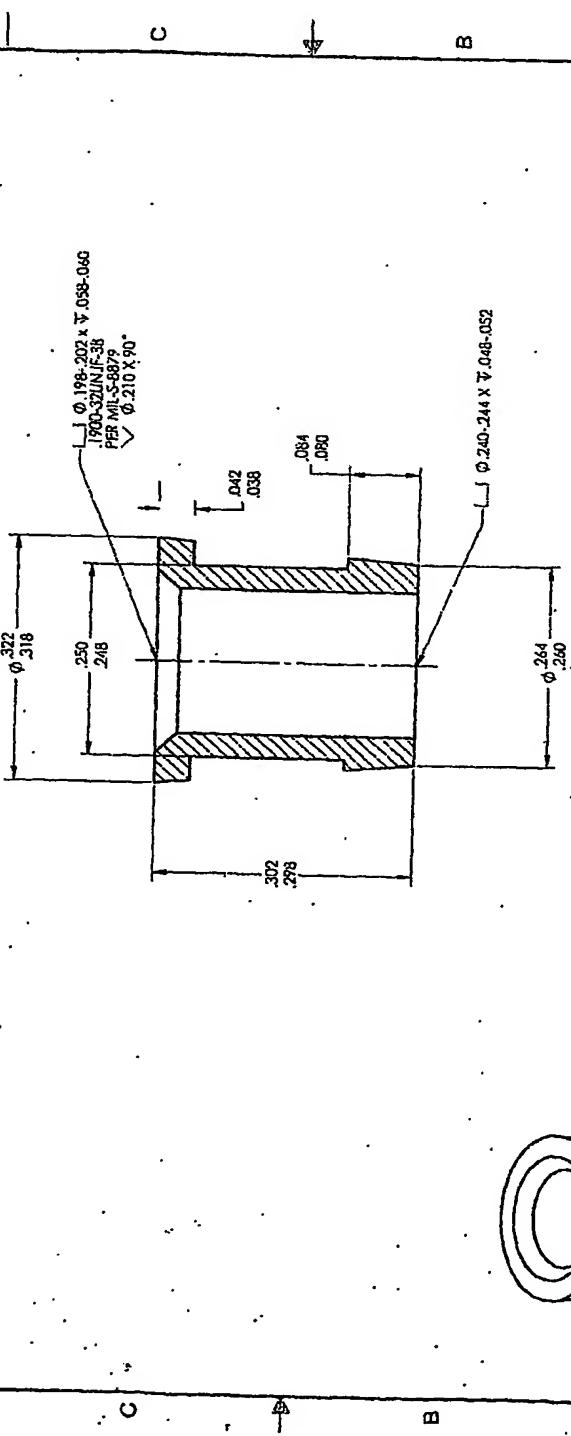
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Page 14 of 16

Dr. A. C. W. 4

- 1. ALL DIAMETERS:



## ***Invention Disclosure***



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Page 15 of 16

PRINTING 5

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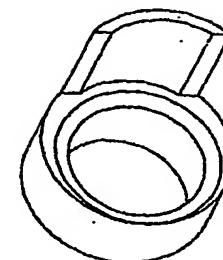
A technical drawing of a circular component. It features a central hole and several concentric lines. A dimension line with arrows at both ends spans the distance from the center to the outer edge, labeled 'R.100'.

1900-32UNJF-3B THRU THREAD  
2X 1/2" 210 X 90.

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1



MANUFACTURING DRAWING  
**SOLIDWORKS DWG**

114

